

Study on Earthquake Resistant Reinforcement of Existing Quay in Fishing Port to Nankai Earthquake

Kojiro Okabayashi, Kozo Tagaya, Youya Hayashi
Civil Engineering, Kochi National College of Technology
Nankoku, Japan

ABSTRACT

In Kochi Prefecture, the fishing ports are desired to maintain the function of port at least by the simple sectional reinforcement against the earthquake motion and tsunami by Nankai Earthquake. This research was executed to the Kaminokae Fishing port, where is one of the typical fishing port in Kochi prefecture. The prediction of liquefaction was performed based on Momentary Deformation Modulus(MDM) Method. The economic construction method such as by the replacement of methods of the light weight treated soil and by the driven sheet pile, which can improve the earthquake-resistant, are discussed. As a result, 1)In Kaminokae Fishing Village the strong possibility of liquefaction in most area was observed. 2)The replacement methods by the light weight treated soil and the driven sheet pile can improve the earthquake-resistant for the fishing port.

KEY WORDS: Nankai Earthquake; liquefaction; Tsunami; MDM method; fishing ports; earthquake-resistant

INTRODUCTION

The Nankai Earthquakes, of which epicenters are at the Nankai Trough in the offshore in the Tosa Bay, has occurred repeatedly every 90-150 years. The Japan government officially announced that the earthquake will occur with the 50 per cents of probability within the coming 30 years, and with the 80 per cents of probability within 50 years.

According to the "The second earthquake assessment of Kochi Prefecture", it is assumed that the Nankai Earthquake ground motion has maximum acceleration 400 galls or more, long period wave of 2-3 seconds, and continues for about 90 seconds. The height of the maximum tsunami is 6-10 meters.

Kochi Prefecture has approximately 270 km coastal-line on which 130 fishing ports are scattered and 69,000 people live in this area. And the fishing ports will be expected to suffer from the serious damage by the earthquake motion and by the tsunami caused by Nankai Earthquake (Okabayashi, Tagaya, Takeuch and Ono, 2004).

The fishing ports are very important as the life base of local populace for the relief activity, restoration-reconstruction and business continuity plan. The fishing ports are desired to be maintain the function at least by the sectional reinforcement against the earthquake motion and

tsunami by Nankai Earthquake. This research was executed for the Kaminokae Fishing Village, where is the typical district of the local fishing port in Kochi Prefecture. The prediction of liquefaction was performed based on Momentary Deformation Modulus(MDM) Method.

The economic construction methods such as by the replacement methods by the light weight treated soil and by the driven sheet pile, which can improve the earthquake-resistant, are discussed.

PREDICTION OF GROUND LIQUEFACTION

The points of the liquefaction prediction in Kaminokae Fishing Village are shown in Fig.1. For the detailed estimation of liquefaction, the four borings (Nos. A-D) to reach to the bedrock were performed in addition

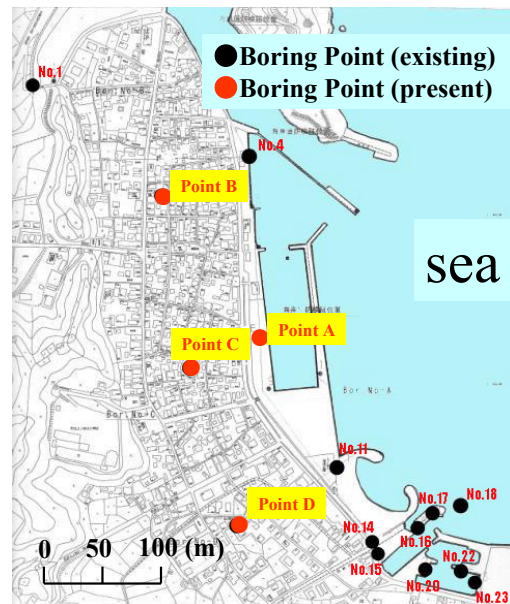


Fig.1 Soil investigation point at Kaminokae